Appendix F

HM 3.0 and HM 2.2.2 Distribution Distances and Street Lengths within Selected California CBGs Contained Entirely within GTE Wire Centers (miles)

CBG	HM 3.0 Distance	HM 3.0 Cable Sums	HM 2.2.2 Distance	Length of Streets	Claritas Areas
(1)	(2)	(3)	(4)	(5)	(6)
60650444.027	17.05	32.04	3.97	36.24	20.20
60650438.064	19.94	45.45	3.71	54.86	17.65
60650438.061	13.27	27.23	3.16	15.20	12.79
60650438.063	25.21	84.53	2.97	74.41	11.27
60710109.007	20.30	31.53	0.96	34.38	2.35
60710110.002	11.54	16.52	0.95	24.95	2.29
60710110.001	16.70	26.74	0.89	34.73	2.04
60830017.023	28.47	92.86	0.86	12.87	1.88
60710109.001	16.58	26.95	0.83	31.77	1.76
60710109.006	17.03	26.76	0.78	25.68	1.55
60650443.001	13.14	26.61	0.96	11.69	1.19
60830017.012	13.62	42.09	0.68	10.99	1.17
60650442.001	17.80	31.76	0.87	12.60	0.97
60650443.002	12.54	29.37	0.82	7.55	0.87
60830016.013	15.53	28.03	0.55	9.03	0.77
60650442.002	11.80	22.32	0.70	11.90	0.63
60650441.003	12.59	22.71	0.63	7.83	0.51
60830017.021	5.21	16.69	0.43	6.07	0.48
60650441.005	10.87	20.35	0.61	9.95	0.48
60830016.011	6.99	10.81	0.42	4.53	0.46
60830016.012	11.13	25.26	0.42	6.66	0.45
60830016.026	7.60	30.86	0.35	2.80	0.32
60650438.069	2.83	3.53	0.38	3.21	0.18
60830016.022	4.19	10.13	0.25	3.03	0.16
60830016.023	4.19	6.45	0.25	2.73	0.16
60650441.004	3.38	8.63	0.35	3.77	0.16
60830016.027	4.02	9.70	0.24	3.70	0.15
60830016.025	4.59	11.47	0.22	3.53	0.12
60830016.021	3.05	7.56	0.21	2.91	0.11
Total,29CBGs	351.17	774.92	28.43	469.58	83.11
Total,AllCBGs	52,190.71	129,294.60	2,955.34		
Ratio of Street Lengths to HM 2.2.2 Distance, Selected CBGs					16.5

Table 3

Actual versus Hatfield 2.2.2 Comparison
GTE of California, Inc.
($1,000,000)

Cost Category	Actual	Model	Model/Actual
(1)	(2)	(3)	(4) (3)/(2)
Network Investment	3,759	2,598	69.11%
Switching Investment	902	366	40.58%
Indirect Investment	2,823	1,060	37.39%
Total Investment	4,042	2,704	66.8 %
Network Expenses	197	81	41.35%
Switching Expenses	55	10	17.78%
Indirect Expenses	165	171	103.66%
Corporate Expenses	175	70	39.70%
Total Expenses	536	322	60.00%

Actual Versus Hatfield Model Release 3.0 Comparison
GTE Telephone Operations, Texas
($1,000,000)

Cost Category	Actual	Model	Model/Actual
(1)	(2)	(3)	(4) (3)/(2)
Network Investment	3,399	2,220	65.3%
General Support Investment	562	132	23.4%
Total Investment	3,976	2,352	59.1%
Network Expenses	119	59	49.1%
Support Expenses	171	72	42.2%
Corporate Expenses	159	53	33.6%
Total Expenses	449	184	41.0%

The main cause of such a large discrepancy between observed data and the Model's predictions is the fact that the Model produces estimates of network element costs based on an *abstract* representation of network service costs. Left to its own devices the Model constructs insufficient amounts of facilities to be able to serve the demand that exists in the real world.

Another insight into a cost model's validity or lack thereof can be gained through comparison of the results to those produced by other models, and the extent to which the model satisfies internal validity checks. Internal validity will be discussed in Section III where the structural deficiencies of the Model are addressed.

More evidence of the Model's lack of external validity is provided by other cost models. We have observed that the cost estimates produced by the Hatfield model are far below those produced by any other cost model. A recent edition of Telecommunications Reports contrasted residential universal service costs produced by three proxy models: the Hatfield model 2.2.2, the Cost Proxy Model (CPM), and the Benchmark Cost Model 2 (BCM2). CPM is sponsored by Pacific Telesis (and adopted by the California Public Utilities Commission in its Universal Service Proceeding) and BCM2 is sponsored by U.S. West and the Sprint Corporation. The Telecommunication Reports comparison revealed that the costs predicted by the Hatfield Model are substantially lower than those predicted by the other two models. CPM and BCM2 produce

Appendix G

Comparison of HM 3.0 and HM 2.2.2 Distribution Distance, Area, Density, and Distribution Cost and Investment for GTE California, GTE Texas and GTE Washington

	Distance (miles)		Area (sq. miles)		Households (000)		Loop Distribution Annual Cost ($mm)		Total Distribution Investment ($mm)	
State	HM 3.0	HM 2.2.2	HM 3.0	HM 2.2.2	HM 3.0	HM 2.2.2	HM 3.0	HM 2.2.2	HM 3.0	HM 2.2.2
Total										
CA	52,190.71	2,955.34	55,461.67	27,036.29	3,657.69	2,358.98	$307.51	$309.95	$1,166.10	$1,158.01
WA	15,054.60	1,377.90	18,562.39	16,161.36	519.68	503.74	$68.94	$81.50	$274.29	$316.18
TX	45,648.28	5,934.53	89,336.71	97,943.76	1,153.99	1,191.52	$131.44	$267.54	$699.49	$1,025.25
Average										
CA	11.30	0.71	12.01	6.45	4,307.05	1,931.01	0.0666	0.0740	0.2525	0.2763
WA	14.67	1.33	18.09	15.55	1,578.40	915.17	0.0672	0.0784	0.2673	0.3043
TX	15.62	2.01	30.56	33.10	1,588.15	757.58	0.0450	0.0904	0.2393	0.3465
Ratio of HM 3.0 to HM 2.2.2, Total										
CA	17.66		2.05		1.55		0.99		1.01	
WA	10.93		1.15		1.03		0.85		0.87	
TX	7.69		0.91		0.97		0.49		0.68	
Ratio of HM 3.0 to HM 2.2.2, Average										
CA	16.02		1.86		2.23		0.90		0.91	
WA	11.06		1.16		1.72		0.86		0.88	
TX	7.79		0.92		2.10		0.50		0.69	

# of CBGs										
CA	4,619	4,191	4,619	4,191	4,619	4,191	4,619	4,191	4,619	4,191
WA	1,026	1,039	1,026	1,039	1,026	1,039	1,026	1,039	1,026	1,039
TX	2,923	2,959	2,923	2,959	2,923	2,959	2,923	2,959	2,923	2,959

HM 3.0 CBG areas are larger than those provided by Claritas in 2,589 instances, and smaller in 2,029. However, among the "larger" HM 3.0 CBGs, the average difference is .70 miles, whereas among the "smaller" HM 3.0 CBGs, the average difference is .02 miles. Thus, while HM 3.0 areas are smaller than Claritas areas around 80% as often as they are larger, the average difference is 35 times greater in the former cases than in the latter.

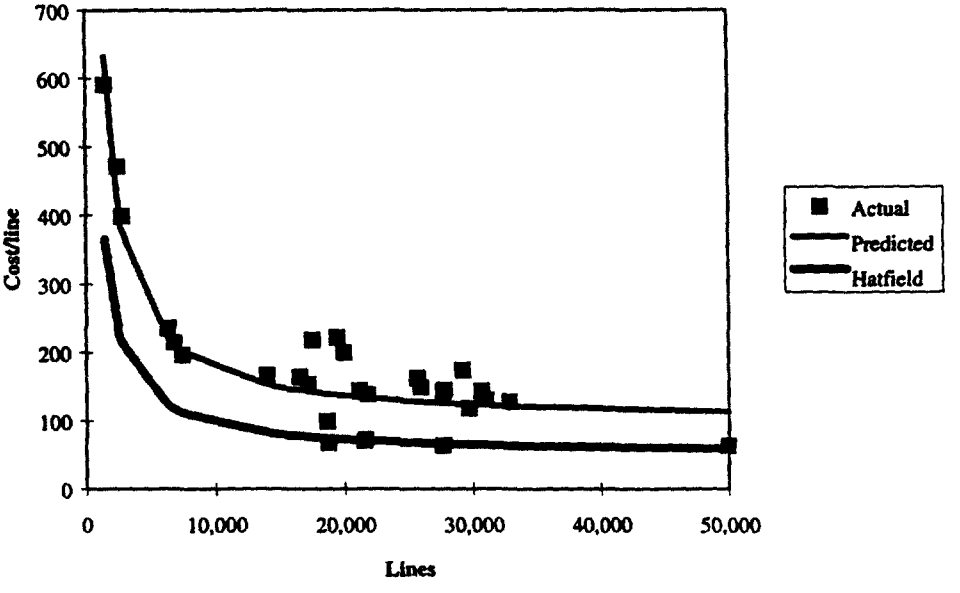
HM 2.2.2 CBG areas are larger than those provided by Claritas in 3,202 instances, and smaller in 987. However, among the "larger" HM 2.2.2 CBGs, the average difference is 2.70 miles, whereas among the "smaller" HM 2.2.2 CBGs, the average difference is .003 miles. Thus, while HM 2.2.2 areas are smaller than Claritas areas around a third as often as they are larger, the average difference is 900 times greater in the former cases than in the latter.

$$C_H = 0.558 * C_G$$

We obtained the above formula which shows the mathematical relationship between switch cost proposed by the Hatfield Model and GTE actual cost using GTE lines as data points and predicting C_H and C_G at each point. The R^2 between the predictions is nearly one, meaning that the switch cost of the Model is nearly identical to 60% of GTE's experience.

The Chart 1 below graphically illustrates the difference between the cost function used by the Model with that of GTE's actual cost function.

Chart 1



More fundamentally, the Hatfield Model ignores the fact that ILECs buy additional lines for installed switches as well as new lines for new switches. The additional lines for installed switches actually cost more, as the McGraw-Hill switch cost study used by the Hatfield model describes:

> The add-on market provides significant revenue potential for switch suppliers, particularly as the margins on new switches remain below the margins for the add-on market. A digital line shipped and in place will generate hundreds of dollars in add-on software and hardware revenue during the life of the switch. Suppliers can afford to lose a few dollars on the initial (new) line sale in exchange for the

Finally, one estimate of actual lives that could be used are those currently espoused by the IXC's. In 1994, AT&T proposed at the FCC (the last time that AT&T had to go before the FCC to get lives approved) the following lives (compared to the depreciation lives proposed in HM 2.2.2 and 3.0):

		1994 AT&T Proposal	Hatfield 2.2.2 Proposal	Hatfield 3.0 Proposal -
	Switch	9.7	14.3	16.54
Copper Cable:	**Aerial**	3.4	20	16.8
	Buried	15	20	19.86
	Under Ground	9	20	21.17
Fiber Cable:	**Aerial**	14.3	20	22.11
	Buried	16.8	20	24.13
	Under Ground	12.8	20	22.87

In addition to these plant specific lives, if one uses 1995 financial data from AT&T and MCI, their depreciation rates rage from 10-11%. These would yield a 9-10 year average plant life. These values are well below what Hatfield has proposed and even the values used in the BCPM, BCM2, and the CPM.

HM 3.0 offers no improvement over HM 2.2.2 in the calculation of expenses. HM 3.0 inputs still include underestimated values from a New Hampshire Marginal Cost Study, e.g. Billing /bill inquiry per line per month, alternative CO switching factor, and the alternative circuit equipment factor. In addition, HM 3.0 assumes that the level of investment is the major driver of expenses. This may be unrealistic assumption. For example, does the long loop, high investment customer incur more common costs, network operations, etc.. In fact, there are multiple drivers of operating expense. These should be investigated and used to derive the expenses.

Even if investment was determined to be the best driver of operating expenses, Hatfield's use of the ARMIS ratios is flawed. HM 3.0 still uses embedded plant to determine expense ratios, however, these are applied to Hatfield's forward looking investments. These forward looking expenses only represent 769/1609 of the embedded investment (based upon the 2.2.2 results as reported in paragraph 31 of the FCC staff analysis[13]). Therefore, the expenses in the Hatfield model reflect only

[13] "*The Use of Computer Models for Estimating Forward-Looking Economic Costs: A Staff Analysis*," CCBPOL97-2, DA97-56 (rel. Jan. 9, 1997).

	(1) TOTAL POLES OWNED BY GTE	(2) POLES OWNED BY GTE AND JOINTLY USED	(3) POLES PARTIALLY OWNED BY GTE	(4) POLES OWNED BY POWER COMPANY AND JOINTLY USED	(5) TOTAL POLES USED BY GTE (1+3+4)	(6) POLES USED SOLELY BY GTE (1 - 2)	(7) % USED SOLELY BY GTE (6) 5)
ALL GTE REGIONS	2,284,116	467,188	578,376	3,032,640	5,895,132	1,816,928	30.8208%

Next, GTE determined the percentage of costs it bears for poles in each of these categories. For those poles used solely by GTE, no calculation is needed: GTE bears 100% of the costs associated with that 30.8208% of the total poles.

Determining the percentage of GTE's costs for the remaining 69.1792% of the poles is more complicated because of variable arrangements GTE has with power companies for sharing costs of jointly used poles. These arrangements typically call for GTE to bear 40-45% of the annual cost, with the power company bearing the remaining 55-60%. The calculation is made slightly more complicated because 47 U.S.C. § 224 mandates, at present, a pole rental charge for cable TV of 7.4% of the annual carrying cost of the pole (including depreciation). Both currently and on a forward-looking basis, the attaching cable TV provider pays the rental charge directly to the owner of the pole. The owner of the pole does not share that revenue.

With this information, GTE calculated its percentage of pole costs as follows for the 69.1792% of total poles in which it is a joint user, assuming that the contractual

arrangement with the electric utility calls for GTE to pay 40% of the annual pole costs, with the electric utility paying the remaining 60%.[117]

Cable TV Co.'s share:	7.4%
Power Co.'s share:[118]	Power company's contractual share of pole costs - (cable TV's share x % of jointly used poles solely owned by Power) -- expressed as a percentage
GTE's share:	GTE's contractual share of pole costs - (cable TV's share x % of jointly used poles solely or partially owned by GTE) -- expressed as a percentage

Inputting figures for GTE nationally, the following is the percentage for the 69.1792% of poles jointly used by GTE:

Cable TV	0.074		=	7.4%
Power Co.	0.60 -	(0.074 x 0.743621)	=	54.4972%
GTE	0.40 -	(0.074 x 0.256379)	=	38.1028%

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[117] Because this calculations assume that both an electric utility and a cable TV provider are attached to each pole that GTE jointly uses with some other company, the result is extremely conservative. In many instances, GTE shares the pole with only one company -- usually the electric utility. And in any instance where GTE shares solely with a cable TV provider, GTE's actual percentage of the pole costs would be 92.6% (100% less the 7.4% it receives from the cable TV provider) -- much higher than the figure that results from the calculation assuming that all three utilities share each jointly used pole.

In addition, GTE has assumed that it is the complete owner of every partially owned pole and therefore receives the total contribution from the attaching cable TV provider on each pole. In reality, GTE would have to share this percentage with its co-owner, but GTE's assumption adds to the conservative nature of its calculation. And as demonstrated *supra*, the number of poles GTE partially owns -- and therefore for which it would have to share cable TV revenue with another owner -- actually exceeds those poles GTE fully owns but jointly uses with another utility.

[118] *See* Attachment C for calculation of percentage of jointly used poles owned by Power companies and by GTE.

100% of jointly used poles

To arrive at GTE's total costs for both poles it uses solely by itself and poles it uses with another utility, the percentage of poles it uses by itself (30.8208%) is added to 69.1792% of the percentage just derived for GTE for jointly used poles (38.1028%):

Percentage of poles solely used by GTE	=	30.8208%
69.1792% x GTE's share of poles used with other utilities (38.1028%)	=	26.3592%
Total	=	57.1800%

The same calculation can be performed assuming the contractual arrangement with the power company calls for GTE to bear 45% of the costs, with the power company paying the remaining 55%. The results of the calculation using the 60/40 split and using the 55/45 split are as follows:

FRACTION OF TOTAL AERIAL COSTS BORNE BY GTE ASSUMING 60-40 SPLIT ON COSTS OF JOINT POLES	FRACTION OF TOTAL AERIAL COSTS BORNE BY GTE ASSUMING 55-45 SPLIT ON COSTS OF JOINT POLES
0.5718145408 or 57.18%	0.606390 or 60.64%

Thus, GTE's average share of the cost for poles range from 57% to 61% of pole costs -- far more than the 33% assumed by the Hatfield 2.2.2 model. In any event, 60% is an extremely conservative estimate of GTE's current share of pole costs in a typical region.